"STRATEGIES IN THE MANAGEMENT OF FAILED NECK ANASTOMOSIS IN PHARYNGO ESOPHAGEAL RECONSTRUCTIONS AFTER CORROSIVE INJURY ESOPHAGUS"

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CERTIFICATE

This is to certify that this dissertation entitled **"STRATEGIES IN THE MANAGEMENT OF FAILED NECK ANASTOMOSIS IN PHARYNGO ESOPHAGEAL RECONSTRUCTIONS AFTER CORROSIVE INJURY ESOPHAGUS"** presented here is original work done by **Dr.B.KESAVAN**, M.Ch Post Graduate in the Department of Surgical Gastroenterology and Proctology, Center of Excellence for Upper GI Surgery, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai- 600003 in partial fulfillment of the university rules and regulation for the award of M.Ch in Surgical Gastroenterology and Proctology-Branch VI, under my guidance and supervision during the academic period from August 2010- March 2013.

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DECLARATION

I, **Dr.B.KESAVAN** hereby solemnly declare that this dissertation entitled **"STRATEGIES IN THE MANAGEMENT OF FAILED NECK ANASTOMOSIS IN PHARYNGO ESOPHAGEAL RECONSTRUCTIONS AFTER CORROSIVE INJURY ESOPHAGUS"** was done by me in the Department of Surgical Gastroenterology and Proctology, Center of Excellence for Upper GI Surgery, Madras Medical College & Rajiv Gandhi Govt. General Hospital, Chennai-3 during August 2010 to March 2013 under the guidance and supervision of **Prof. S.M.CHANDRAMOHAN M.S,M.ch, FACS**. This dissertation is submitted to the Tamil Nadu Dr.M.G.R.Medical University towards the partial fulfillment of requirement for the award of M.Ch.,Degree in Surgical Gastroenterology.

Signature of the Candidate

Date :

Place :

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INDEX

INTRODUCTION

Caustic ingestion can produce a progressive and devastating injury to the esophagus and stomach. Accidental or suicidal ingestion of acids is encountered more often in our country, whereas lye or alkaline corrosive injuries are more frequent in developed countries

Stricture formation with dysphagia after the injury is unavoidable in some cases. In severe strictures, due to the complications and the ineffectiveness of the dilatation, esophageal replacement is often required[1]. Stomach and Colon interposition is a reliable esophageal replacement but colon is the most preferred conduit after caustic esophageal injury. It provides extended conduit length, reliable blood supply and long term function[2].

Complication following conduit interposition requiring intervention may be acute or chronic. Surviving patients suffer from anastomotic leaks followed by stricture formation and loss of intestinal continuity due to resection following conduit ischemia .

A stricture that are not amenable for dilatation and short segmental loss of conduit following conduit necrosis require complex procedures to

re-establish swallowing and management will vary according to etiology[3] .From this study , we are trying to provide management strategies for failed neck anastomosis after pharyngoesophageal reconstructions in corrosive injury esophagus.

AIMS AND OBJECTIVES

To analyze the causes of failed neck anastomosis in pharyngo esophageal reconstructions after corrosive injury esophagus and to describe our management strategies.

REVIEW OF LITERATURE

INTRODUCTION

Corrosives ingestion can produce a disastrous and chronic progressive injury to the esophagus and stomach. Caustic ingestion is commonly encountered in children who swallow accidentally or in adults for suicidal purposes[4] The two common chemicals implicated in caustic burns are alkali and acids. The concentration and amount of the ingested material have an important impact on the injury. Strong alkali such as sodium and potassium hydroxides in various forms are used as cleansing agents in washing detergents, drain and cleansers. Acids such as sulfuric acid and hydrochloric acids are commonly available in toilet bowel cleansers, battery fluids and slate cleansers[5]. Injury from ingestion of caustic agents may include oral cavity, larynx, pharynx, esophagus, stomach and sometimes duodenum and jejunum. Complications such as esophageal and gastric perforation, sepsis, respiratory compromise and even death may occur. Stricture formation with dysphagia to food after the injury is imminent in some cases. Different therapies recommended in the literature are inconclusive and controversial. In patients with chronic strictures, repeated dilatations may be necessary to maintain an adequate

lumen diameter. In more severe type, due to ineffectiveness and the complication associated with dilatation, surgical replacement of the esophagus may be required[5]. Information to the public is required to educate the population regarding the dangers of these corrosive products. Safe storage of corrosive liquids in containers with hazard labels is needed to reduce the accidental ingestion of corrosive material. Directions to make changes in the chemical composition and safer preparation of these products should be given to commercial institutions.

PATHOGENESIS

The injury inflicted by swallowing caustic substances is related to the nature of the agent and the amount swallowed. Accidental ingestions are associated with consumption of lesser quantities because after the first gulp the patient will expectorate or try to dilute the agent, whereas in a deliberate suicide attempt the initial revulsion and discomfort is ignored. Further, in suicidal ingestions the patient may be socially isolated at the time and may delay seeking medical attention. In general, caustic alkali causes more profound injury than acid[6]. This is because acid produces coagulative necrosis, which acts as a kind of barrier to limit deeper levels of injury, whereas alkalis tend to cause liquefactive necrosis, allowing deeper penetration[7].

The initial contact with the toxic agent on the mucosa causes inflammation, which if severe leads to necrosis in the first 24 hours. Experimental studies have shown that severe transmural injury can develop after exposure to strong alkali (pH > 12) for even 1 second[8]. Thus, although the final outcome is very dependent on access to timely and expert medical treatment, the extent of injury is determined within a very short time of ingestion. Extensive thrombosis of submucosal vessels is observed at 48 hours, with the inevitable necrosis of the mucosa. Although acid materials may produce an eschar, which limits the esophageal damage, they tend to induce pylorospasm and lead to more severe gastric damage with the development of antropyloric stricturing. Acid appears to be the causative agent in most cases of gastric stricture after caustic ingestion.

Purely esophageal damage is deeper with strong alkali agents. In the second and third week, granulation tissue begins to replace the necrotic slough and the process of stricturing begins. It is in the period of 4 to 14 days when the esophagus is most likely to be perforated by endoscopy or dilation, and traditional recommendation was therefore to avoid instrumentation of the esophagus at that time.

The pH of the ingested material is a major factor in determining the extent of injury. Most domestic cleaning products are much less alkaline, including sodium hypochlorite with a pH of 9, and cause correspondingly less damage. concentrated hydrochloric acid used as a toilet cleaner in India has a pH of zero. Since the stomach physiologically contains hydrochloric acid in the pH range 1.2 to 1.5, and episodes of acid reflux in the range pH 2 to 3 are common in the esophagus. It must be remembered that the household form is more than 10 times as concentrated as the physiologic form[9]. When a large quantity of concentrated hydrochloric acid is ingested, pyloric spasm causes retention of the material in the antrum, where it overwhelms the normal defense mechanism. Conceptually, the injury can be thought of in three categories based on depth of injury are shown in table-1.

Table-1: Degree of caustic burns

Degree of injury	**Depth of involvement**
First-degree	Involving only the mucosa that heal without sequelae.
Second-degree	Injuries into muscular layer that heal with esophageal stricture
Third-degree	Transmural injuries with or without perforation, or undilatable stricture in recovery phase

CLINICAL FEATURES

The clinical presentations of caustic injuries depends mainly on the site and depth of injury caused by the caustic agent. In the mildest form of injury, the patient presents to the emergency room with a history of caustic ingestion and reporting only minor symptoms such as a sore throat, or no symptoms at all. There may be normal mucosa or mild erythema in the oropharynx, but the voice is normal, the patient can swallow his or her own saliva, and there is no systemic toxicity. This is commonly the situation with children.

In moderate to severe form, early manifestations include persistent salivation, dysphagia, hoarseness, voice and stridor due to involvement of pharynx and larynx , retrosternal chest pain due to injury to the thoracic part of the esophagus or perforation with mediastinitis .Epigastric pain; retching; or emesis of tissue, blood, or coffee-ground material due to severe gastric injury. Fever, shock, dyspnoea, and acute abdomen strongly indicate esophageal or gastric perforation[10]

Late complications of caustic injuries include dysphagia due to the establishment of esophageal stricture as early as1 to 2 months. The location of the stricture depends on the rapidity with which the toxic

material was transported down the esophagus. Damage tends to be maximal at areas of natural narrowing, such as the cricopharyngeal sphincter or the site of the left main bronchus. Gastric stricture tends to be a consequence of concentrated acid consumption. Early satiety, weight loss, and progressive emesis suggest gastric outlet obstruction. Acute abdominal distension due to formation of Gastrocoel when the distal end esophagus also got strictured[11]. Repeated chest infections may indicate either recurrent aspiration or tracheo-esophageal fistula.

DIAGNOSIS

Radiologic Studies

During the acute phase of caustic injury, plain chest and abdominal films should be taken to reveal any evidence of perforation such as pneumomediastinum, pneumothorax, pleural effusion, or pneumoperitoneum[5].

Contrast Studies

If perforation is suspected despite negative plain films, water-soluble contrast study may reveal perforation with extravasation of contrast. However the sensitivity rate is low in identifying very small perforation and patients are at risk of aspiration which leads to pulmonary

complication such as pneumonitis. Studies suggested that thin barium contrast study which delineate small perforation will be useful in such cases[5]

Barium contrast is most useful in evaluating the cervical esophagus, body of the esophagus, and the antropyloric region of the stomach during chronic phase approximately 3 weeks after injury. Strictures can be of variable length, and number. Most strictures are in the region of the cricopharyngeal sphincter and mid thoracic esophagus in the region of the aortic arch[10]. It is of utmost importance to study the status of the inlet before surgery to plan for the site of the proximal anastomosis, and to study the outlet to detect any gastric antral stenosis. Any missed strictures may affect the success of the surgery after esophageal replacement.

Computed Tomography

Computed tomography (CT) of the esophagus and stomach with oral contrast is the most sensitive and excellent diagnostic modality in detecting early perforation. With this approach, life-threatening injuries can be identified, especially in patients with atypical presentation and can be treated at an early stage[10]. Esophageal wall thickness can be measured in the chronic stages of the illness with a contrast-enhanced CT scan.

Upper GI Endoscopy

Endoscopy is the single most valuable diagnostic tool in planning management of caustic ingestion. It is indicated in all but the most trivial injuries. several studies have shown clearly that a patient who is asymptomatic on presentation will not have significant damage detected by endoscopy[12]. Thus, all symptomatic patients should be endoscoped. The examination may be performed in the emergency department under sedation in patients with mild symptoms, but when the patient has altered mental status and is simultaneously intoxicated, or has drooling and difficulty in swallowing, it is preferable to perform endoscopy under general anesthesia with airway protection in the operating room.

As a result of the endoscopy, the injury can be classified into three major categories as modified by Zargar et al (table 2)[13]. Grade 1and Grade 2A heal without incident but grade 2B lesions tend to heal by stricturing. Third-degree burns are characterized by full-thickness necrosis and may require immediate esophagectomy if extensive but most often leads to death.

Table-2

Grade of injury	Endoscopic finding
Grade I	Mucosal edema and hyperemia
Grade II A Grade II B	Friability, erosion and exudates As above plus deep or circumferential ulceration
Grade III A Grade III B	Multiple deep brownish-black or gray ulcers Extensive areas of necrosis or Perforation

MANAGEMENT

The principle of management is to identify and treat complications as early as possible during the acute phase, and to avoid the formation of intractable strictures in the esophagus and stomach, and to replace or bypass the diseased organ to allow oral intake of food in the later phase.

The management of caustic ingestion can be subdivided into three phases:

The early phase, where patients presenting in the emergency department, immediate assessment of ABC and early resuscitation should be done followed by the extent of injury by checking the airway, oral cavity, neck for crepitus and tenderness and the abdomen for tenderness. Decision on the disposition of the patient must be carried out whether to be

discharged, admitted for observation, or intensive care unit (ICU) admission or urgent surgery.

The intermediate phase involves dealing the patient in hospital with issues such as electrolyte imbalance, sepsis, respiratory complications, maintenance of nutrition, and managing the patient through a potentially complicated postoperative course after emergency surgery such as resection of esophagus and/or stomach.

The chronic phase is aimed at function restoration after recovery from the acute attack, and may involve such elements as psychosocial support and counseling, nutritional support, repeated endoscopy for stricture, and major reconstructive surgery of the oropharynx and upper digestive tract.

During the acute phase, the patients are kept nil by mouth with IV fluid support until edema subsides and oral feeds can be started on if the patient tolerates; if dysphagia persists, we perform feeding jejunostomy to maintain nutrition of the patient. Endoscopy is performed if a patient presents before 72hrs of consuming corrosive agents to assess the depth of injury otherwise it is usually performed after 6 weeks. Psychiatric counseling for adult patients with underlying depression that precipitated ingestion of caustic substance is also important .

Acid suppression

Caustic esophageal injury results in esophageal shortening due to lower esophageal sphincter (LES) damage and leads to gastroesophageal reflux (GER) and injury to the stomach with antro- pyloric stenosis induces or aggravates GER[14]. Acid suppression has been generally recommended to avoid such exacerbation of the esophageal

Steroids

The value of systemic steroids has been debated for years, but the general advice, based on a single randomized controlled trial in 1990, is that they carry no advantage[15]. Other recent nonrandomized series suggest that stenosis is reduced, but at the expense of a higher incidence of gastrointestinal (GI) hemorrhage[16].

Stents

Early dilation and stenting are sometimes recommended as a means to reduce the severity of future stricturing. It seems intuitive that if the contraction of collagen could be prevented in the first few weeks after injury, stricture severity could be reduced[17]. However, migration, bleeding, and tissue ingrowth sometimes requiring esophagectomy to

remove the stent have all been reported, and the progression to stricture is likely to be determined by the initial injury rather than the treatment.

Nutrition

Throughout the patient's hospital course and the early recovery period when numerous dilations are being performed, there is a serious risk of malnutrition, as a consequence of the severe catabolic state and the fact that the priorities of the medical team are directed to immediately life-threatening considerations. Consequently, attention to nutrition is in danger of being overlooked. Patients may be fed via an indwelling nasogastric tube for fairly short periods of time, but long-term tolerance of this method is poor, and gastrostomy or jejunostomy is more commonly used.

Total parenteral nutrition may be used but is associated with the risks of bacterial translocation and liver impairment and acalculous cholecystitis, and the GI tract should be used when possible

Endoscopic Dilatation

Stricturing begins within the first 2 to 3 weeks and may progress rapidly. Historically, dilation was associated with a high risk of perforation and a major advance in the maintenance of severe caustic injuries in

children came with the introduction of Tucker's retrograde bougie technique[18]. In recent times, flexible endoscopy and through-the-scope balloon dilation have become the commonest treatment, but passing Savary-type bougies over an endoscopically placed guidewire is also effective and considerably cheaper.

Dilatation of esophageal stricture can be done by using Savary-Gilliard bougies and usually starts after 6 weeks on a weekly or biweekly basis and continued upto 6 months. It is essential that dilatation should be gradual and considered adequate when the dilatation of the esophageal lumen achieves 12 mm diameter with complete symptomatic relief[19].

The other method of dilatation of the oesophageal stricture is by balloon dilatation under endoscopic guidance and fluoroscopy . Advantages are that the procedure can be performed under control and the forces are exerted radially. Complication such as perforation, bleeding, sepsis may occur[20]. An adequate lumen of the required diameter can be achieved within 6 months to 1 year with progressive increase in the interval between the need for dilatations. Surgery should be considered when adequate lumen cannot be established or maintained by dilatation therapy.

Indication for surgery includes:

1) Complete stricture of the esophagus , in which all attempts to establish a lumen have failed

2) Multiple, tortuous, or very long strictures.

3) Severe mediastinitis, and development of complication such as Tracheo- esophageal fistula.

4) Patients who are unable or refuses to undergo prolonged periods of dilatation.

Surgical Intervention

Most beneficial time for esophageal replacement surgery after corrosive injury is still controversial. When perforation is demonstrated emergency surgical exploration is indicated. After the injury, full fibrosis stopped in about 6-12 months[21], and the level and length of stricture in the esophagus cannot be assessed till that period. If surgery is performed too early when the scar has not completely formed, risk of anastomotic stenosis is high and when the operation is carried out at least six months after the injury, the results of successful surgical management is greater.

Esophageal bypass avoids the need to dissect out a densely scarred esophagus with the attendant risk of injury to the great vessels, thoracic duct, and the trachea or left main bronchus, and the inevitable consequence of vagal injury. The disadvantage of bypass is that the remaining esophagus is prone to undergo cystic dilation, with occasional rupture[22]. It is inaccessible to endoscopic examination. There is an increased risk of cancer in the esophagus after caustic injury. The magnitude of the risk is debated, but it is alleged that the risk is 1000 times that in the general population. It tends to present more than 30 years after injury[23].

It has been argued that the increased mortality as a consequence of attempted resection outweighs the theoretical advantage of reducing the cancer risk. Resection of the esophagus after transmural caustic injury can be a formidable undertaking. It usually requires thoracotomy because the dense periesophageal scarring, both as a result of the injury itself and possibly superimposed microperforations from numerous dilations, makes it difficult and dangerous to accomplish via the transhiatal route. Although the balance of evidence cannot be dogmatically determined, it can be confidently asserted that if esophagectomy is to be performed, it should be done in a high-volume center where experienced surgeons and intensive care are available.

There is an ongoing debate among esophageal surgeons about the relative merits of colon interposition compared with gastric pull-up to replace a damaged esophagus. Gastric pull-up requires only one anastomosis, is generally quicker, and easy to perform. However the functional results tend to deteriorate with time, with the development of symptomatic reflux, stricture, and columnar metaplasia above the anastomosis in the proximal esophageal remnant. In contrast, colon interposition is a more extensive procedure requiring three anastomoses, but the functional results remain stable or improve with time. In a long-term study of anastomotic stricture after esophagectomy, the colon interposition had a lower incidence of stricture than gastric pull-up[24]. When applied to caustic stricture, there are even stronger grounds for preferring colon interposition, because the stomach has often been damaged by the caustic agent and is scarred and foreshortened.

When the pharynx and laryngeal mechanism are spared and the esophageal stricture is located well below the cricopharyngeus, surgical treatment differs little from standard principles of esophageal replacement for other more common diseases, with the caveat that a transthoracic rather than transhiatal approach is preferred. The operative description of the technique of colon interposition as described

by DeMeester et al in 1988 has never been bettered[25.] In the case of the patient with a caustic ingestion, there is an especially high risk of developing anastomotic stricture due to progressive scarring in the proximal esophageal stump and may be tension on the anastomosis[26].

Strictures high in the esophagus and pharynx are much harder to manage than those in the tubular esophagus or stomach. This is because of the difficulty of restoring swallowing without creating intractable aspiration. The laryngeal or subglottic stricture is characterized by progressive dysphonia eventually mandating tracheostomy. Direct laryngoscopy shows that the epiglottis is scarred and deformed and adherent to the pharyngeal wall. The vallecula and one or both Piriform sinuses may be occluded by scarring. In this situation, the chances of restoration of speech are so remote that the patient is better off with a primary laryngectomy and end tracheostomy. Once this key decision is made, a colon interposition or gastric pull-up can then be performed to the base of the tongue, and even the impaired pharyngeal apparatus that remains can generally be sufficient to permit the patient to have adequate swallowing to maintain nutrition without tube feeding.

For patients with pharyngeal involvement but with limited damage to the laryngeal mechanism, the ultimate goal of therapy is the preservation

of both swallowing and speech. The difficulty is not simply the physical provision of a conduit, the problem is that intractable aspiration occurs. If both Piriform sinuses are open, the prognosis for safe swallowing is relatively good. If one Piriform sinus is preserved, it may still be possible to perform a safe anastomosis. When both are occluded by scarring, the larynx is also severely damaged. Many ingenious surgical solutions have been proposed, including anastomosis to the piriform sinus as advocated by Tran Ba Huy et al[27], or the pharyngocoloplasty as described by Popovici, a Romanian surgeon with a personal series of 253 esophageal reconstructions for caustic injury.

RECONSTRUCTION TECHNIQUES

Colon substitution

Abdominal part

A long midline incision is used, extending from the xiphoid process to below the umbilicus. Careful exploration is needed to search for unsuspected intraabdominal pathologies. The colon is then mobilized from the ascending to the sigmoid level. Total detachment of the omentum from the colon, leaving it attached to the stomach. Mobilization of the splenic flexure is unnecessary and it avoids injury to the left colic vessel

Although left hemicolon has more reliable blood supply and an advantageous size match, an isoperistaltic placement of the right colon segment is preferred based on left colic vessels. we preserve middle colic vessel wherever possible, as bifid origin of the right and left branches of the midcolic artery does not permit retrograde blood flow all the way from the left colic artery to the hepatic flexure, and the marginal artery between the left branch of the midcolic artery and the ascending portion of the left colic artery is critical. Blood supply from the left colic artery is tested with non-traumatic vascular bull-dog clamps occluding temporarily the right and middle colic arteries as well as the colic arcade at both ends of the foreseen colonic graft before ligation and division.

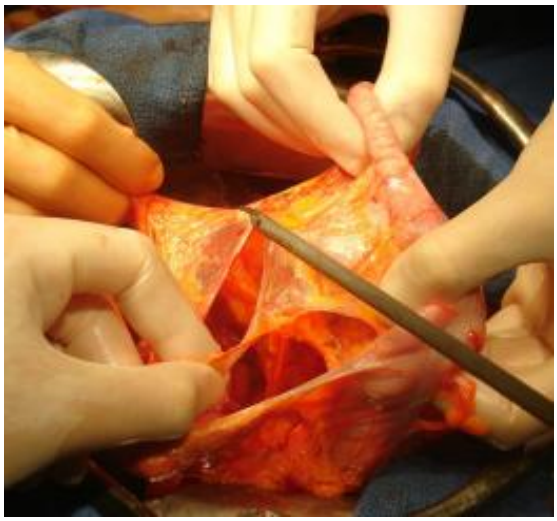
For complete mobility of the hepatic flexure, the right colic vessels often must also be divided. The distance from the point where the colon is tethered by the middle colic artery to the level of the mid neck or the angle of mandible is measured. The distance is then measured around the colon toward caecum and the appropriate transection point is carefully identified. The colon is divided using the GIA stapler both at this point and at the distal transverse colon. The colon can then be passed over the stomach. This maneuver allows the vessels to extend for shortest distance

and prevents angulation or potential compression by a dependent full stomach.

With a viable colon segment, the second team can begin the cervical incision and the abdominal team can start to bluntly develop the retrosternal tunnel. Particular attention is paid to the thoracic inlet portion of this tunnel as it should admit four fingers. Other routes for the colon interposition were subcutaneous tunnel and transpleural route but less often used. The colon segment is then gently drawn upward by means of a guiding Ryle's tube with heavy silk thread, taking care to keep its mesentery on the right without any twist. The viability of the upper end of the segment must be verified not only by visual inspection of its color but also by palpable observation of arterial pulsation. The cologastric anastomosis is carried out end-to-side to the anterior aspect of the midportion of the stomach, using an inner layer of running 3-0 vicryl and an outer layer of interrupted 3-0 silk sutures. The pylorus is palpated to determine the need for a pyloric drainage procedure An end-to-end, two-layer, inverting ileocolic anastomosis with outer interrupted fine silk and running Vicryl suture. Another important step is the closure of the colon mesentery to minimize the likelihood of internal herniation of the small intestine.

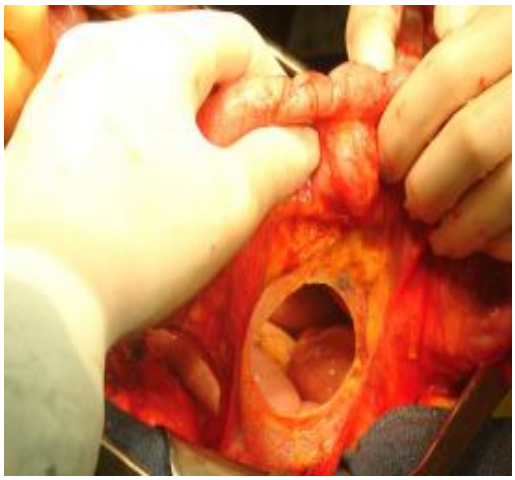
TECHNIQUE OF COLON INTERPOSITION

Transverse colon mobilized from the omentum

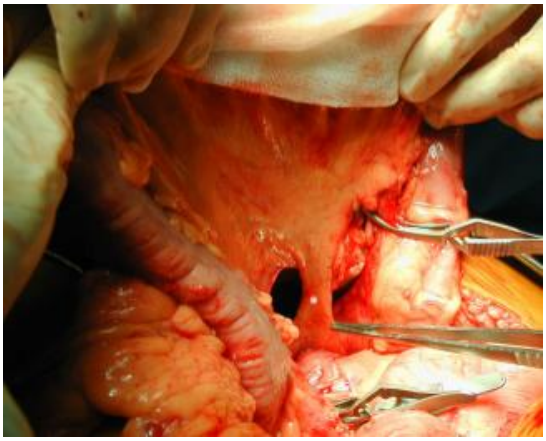


Right colon mobilization

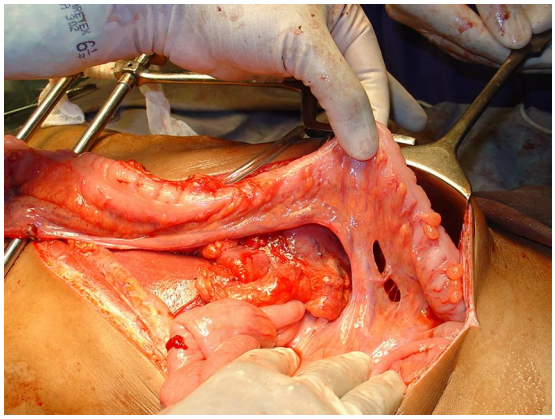
Trans illumination of mesocolon



Midcolic artery

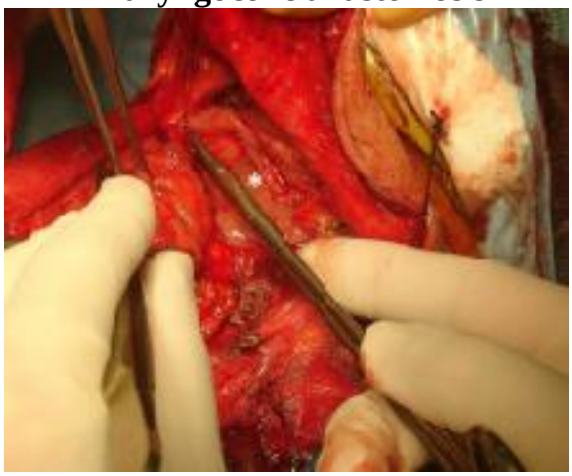


Completed colon conduit



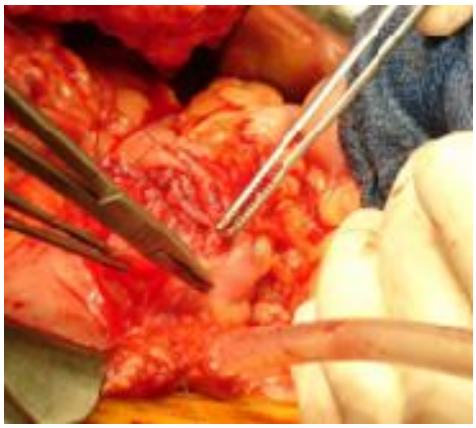
Colon conduit via retrosternal route

Pharyngocolic anastomosis



Cologastric anastomosis

Ileocolic anastomosis



Cervical part

A left-sided oblique cervical incision is a useful approach to the cervical esophagus. It requires dividing the omohyoid muscle, retracting the sternocleidomastoid muscle laterally, dividing the inferior thyroid artery and often the middle thyroid vein, detaching the sternal insertions of the peritracheal muscles, and entering the avascular prevertebral plane. The esophagus if available is encircled, taking care not to damage the membranous portion of the trachea or the recurrent laryngeal nerves The critical esophagocolic anastomosis is carried out in the end-to side fashion using two layers of inverting, interrupted 3-0 vicryl and silk sutures or by stapling technique. If esophagus is not available pharyngocolic anastomosis can be done by side to side anastomosis either by hand sewn or 25mm circular stapler . The nasogastric tube is withdrawn and is replaced distally into the colon bypass . The neck is closed without drains unless there is persistent oozing or contamination.

Gastric substitution

The initial step in mobilizing the stomach is the division of the greater omentum outside the gastroepiploic arcade, which is formed by the right gastroepiploic artery from the gastroduodenal artery at the pyloric

end of the stomach and the left gastroepiploic artery from the splenic artery toward the proximal stomach. The dissection is then directed toward the spleen, where the left gastroepiploic artery is ligated at the upper end of the arcade above the segmental artery to the stomach. The short gastric (gastrolienal) arteries are divided carefully between hemostatic clamps and ligated securely. Ligatures on the stomach must be tied securely as there have been cases of these ties slipping off when the stomach later became distended in the thorax. Left gastric vessels are ligated and divided and gastric tube is carefully constructed with multiple application of GIA 55mm and 75mm stapler. The orthotopic route was an average of 2 cm less than the retrosternal route; the latter is an additional 2 cm less than the presternal subcutaneous route of passage. Anastomosis in the neck is either end-to-side or side to side (esophagus-to-stomach) technique using either hand sewn or stapling technique. A point on the stomach is selected on its anterior aspect at least 2 cm from the gastric transection line in the fundus of the stomach toward the greater curvature and securing the neck anastamosis with sutures at thoracic inlet and at the hiatus to prevent herniation of abdominal contents .The nasogastric tube is directed downward through the anastomosis to the level of the gastric antrum.

Jejunal Substitution

Jejunum represents the third alternative for esophageal replacement. It can be used in one of three ways: (1) as an interposition graft retaining its vascular supply with branches from the superior mesenteric artery and vein, (2) as a Roux-en-Y limb, or (3) as an autograft. Jejunum is most frequently used as a short-segment interposition graft after resection of a distal esophageal stricture. The anatomy of its mesentery makes long-segment interposition difficult, although in children a Roux-en-Y loop readily reaches the neck. As an autograft, free graft with microvascular anastamosis is used for short cervical esophageal stricture or for augmentation of a failed colonic esophageal bypass[28].

COMPLICATIONS

Esophageal replacement surgery performed for severe caustic strictures are associated with a substantial morbidity and mortality related to a variety of complications. Complication pertaining to the conduit excluding the general complications such as cardiopulmonary, wound infection, intestinal obstruction, can be divided as early complications when occurs within 30 days postoperatively and late complications when occurs later than 30 days. Early complication includes anastomotic

narrowing , anastomotic leak and ischemic conduit necrosis. Late complication includes persistent aspiration, intractable anastomotic strictures, redundancy and tortuosity of the colon, chronic fistula , loss of intestinal continuity, reflux esophagitis and colitis from gastroesophageal and gastrocolic reflux .

Ischemic necrosis of the conduit

Conduit ischemia was defined by black or bluish discoloration of the mucous or a clearly demarcated nonedematous mucosa with erythema and ulceration. This may occur intraoperatively in cases with improper assessment of the vascular system in the intestinal graft segment as well as in the perioperative period. For this reason, more precise assessment of the adequacy of blood supply to the intestinal segment should be done. Acute conduit ischemia manifests in the form of lack of pulsation in the vessels of the distal part of intestinal segment or by its pallor. In sustaining vitality, the venous system of the mobilized intestinal graft is also equally important and compromise is evident by cyanosed segment with overfilling, venous stasis, progressive oedema and increased peristalsis [29].

It is also caused by the anatomical conditions in the mediastinum. The superior opening of the retrosternal canal of the sternum is

significantly narrow in comparison to the inferior opening of the canal in the abdomen. Hence graft is most exposed to pressure in the superior part of the canal, and contributes to ischemia and necrosis in the cephalic portion of the graft just beyond the left sternoclavicular joint. Such cases can be managed by removal of the necrotic cephalic portion of the graft and maintenance of healthy portions of the remaining conduit in the retrosternal canal which will be useful later on for reparative surgery than to replace for the entire length of the graft. Mobilization of the remaining primary graft in case of associated redundancy or either pedicled or free intestinal graft interposition may be undertaken at a later stage during reoperative surgery.

Torsion around the vascular pedicle in the retrosternal canal is dreaded complication that produce ischemia and compromise whole graft's vitality. Management in such cases is a repeated operation with removal of the necrotic graft, thorough drainage of the mediastinum and peritoneal lavage, cervical esophagostomy proximally and decompressing gastric fistula distally[30].

Anastomotic leak

Anastomotic leak belong to most common complications associated with esophageal replacement surgery and found more often with colon graft. Many authors suggest the reasons for this condition as a lack of peristalsis in the colon graft, inadequate lumen between the cervical esophagus and the colon and the presence of bacterial flora in the colon, but ischemia in the region of the anastomosis as a result of thrombi in small vessels seems to be most frequent cause. This can be prevented by maintaining good vascular supply and gentle handling of the conduit and tension free anastomosis with proper positioning[31].

The leak usually manifests itself about 6^{th} or 7^{th} postoperative day. The clinical picture of a cervical anastomotic leak is relatively characteristic and does not pose any diagnostic dilemma. Presence of a cervical leak can be confirmed by extravasation of an aqueous solution of oral contrast material during swallowing under fluoroscopy or on endoscopy by visualization of breakdown of an anastomosis. However in small leak, it is difficult to demonstrate on radiological examination, although the presence of a leak is clinically certain [32].

In most of the cases they do not require reoperation and heals with conservative treatment.In large leaks that associated with cellulitis and systemic signs of infection requires drainage of collections if any and patients can be maintained on enteral nutrition through feeding jejunostomy with nothing by mouth. Most of the patients treated in this manner allows closure of leaks in 2-3 weeks. However healing of anastomotic leaks will lead to stricture in more than 50% of cases and chronic fistula in few cases. These strictures and fistula which may be troublesome for the patient on oral feeding, necessitate re-operation that poses more difficulty than the reconstructive surgery.

Anastomotic stricture

The cervical anastomotic stricture is the most common long term complication occurring after the reconstructive procedures. A small leak in the region of cervical anastomosis, which after healing contributes to the formation of a stricture in most of the cases. This complication observed more often after an end-to-end anastomosis and after reconstructions with the use of a colon segment. The reason for this complication is due to the diverse physiology of the colon as well as ischemia at the site of the anastomosis as mentioned before.

Anastomotic stricture was defined as a stenosis that precluded passage of a 9-mm upper GI endoscope and the severity of the stricture was graded by the number of dilatations needed to relieve dysphagia (mild degree- where patients with stricture needs one or two dilatation ,severe degree where patients needs more than 3 dilation [33].Depending on the degree, the patient may experience more or less pronounced dysphagia. Barium contrast study reveals narrowing of the cervical anastomosis often with dilatation of the cervical esophagus proximal to anastomosis with retention of the contrast medium

In a few cases an almost complete anastomotic stricture may develop, and in such patients they usually complains of constant spitting out of saliva and night choking may often occur, leading to aspiration pneumonia. In patients with less extensive stenoses, a good outcome may be achieved by means of an endoscopic dilatation and usually requires several sessions until a desired diameter is obtained. But if the anastomotic stricture is intractable, revision procedures will be needed such as resection and reconstruction of the anastomosis. In revision surgeries, many technical problems starting from difficulties in preparation of both the remnant esophagus and distal part of the esophageal substitute due to adhesion. Damage to the vascular pedicle which is the most

important element results in loss of the cephalic segment of the esophageal substitute . Repair procedures on esophageal substitutes should be performed by experts in high volume center

Redundancy of the conduit

Most patients who undergone long-segment colon interposition develops this complication and redundancy of the colon conduit is a common indication for revision surgery in western countries[34] .Most cases occurred years after the primary reconstruction and in some it has occurred within few months. However, in the long term, all patients develop some degree of redundancy. Redundancy in most cases occurred in the chest and abdomen . The location of the redundancy will be identified with the help of barium swallow and endoscopy . In symptomatic patients who develop dysphagia and regurgitation requires operative intervention that includes segmental resection and primary anastomosis with preservation of blood supply through its main pedicle[35]. To avoid this complication, Demeester et al. advocates careful measurement of the conduit and performing the neck anastomosis first to create a straight course to prevent obstruction and allow for gravitational drainage.

Reflux esophagitis/colitis

Reflux of the gastric content to the esophageal substitute is very common after reconstructive operations due to loss of barrier function of the cardia[36]. The gastric acid content causes inflammatory changes in the mucous membrane of the esophageal substitute of various severity from mild inflammation to hemorrhagic complication , ulcerations even cicatrical stenosis. A long abdominal portion of the esophageal substitute, restoration of pyloric patency provides some barrier against reflux. The clinical symptoms are characterized by retrosternal pain accompanied by belching, sensation of burning especially after big, heavy or spicy meals and relieved to some extent by the use of neutralizing agents and eating more often light meals [37].

Diagnosis can be made by endoscopic examinations with a biopsy to determine the severity of inflammation and to rule out neoplastic changes. Prokinetic agents in combination with proton pump inhibitors (PPI) is effective. Cicatrical stenosis of the distal portion of the esophageal substitute can occur in a few cases which require complicated revision procedures together with partial excision of the distal portion of the graft and reconstruction with pedicled loop insertion from the jejunum or omega-shaped jejunal loop

MATERIALS AND METHODS

All Patients who had undergone pharyngoesophageal reconstruction for corrosive stricture esophagus presenting with complication related to the conduit and neck anastomosis that are managed in our institution from the period of August 2010 to march 2013 were included in the study.

INCLUSION CRITERIA

All Patients presented with complications following pharyngoesophageal reconstruction in the neck following corrosive injury esophagus

EXCLUSION CRITERIA

Patients underwent esophageal replacement for other etiologies such as esophageal malignancy, benign disorders of esophagus, esophageal perforation etc.

Patients have been investigated to identify the cause of conduit dysfunction with barium swallow, upper GI endoscopy mainly and Contrast enhanced CT scan of the neck and chest when and where it is necessary.

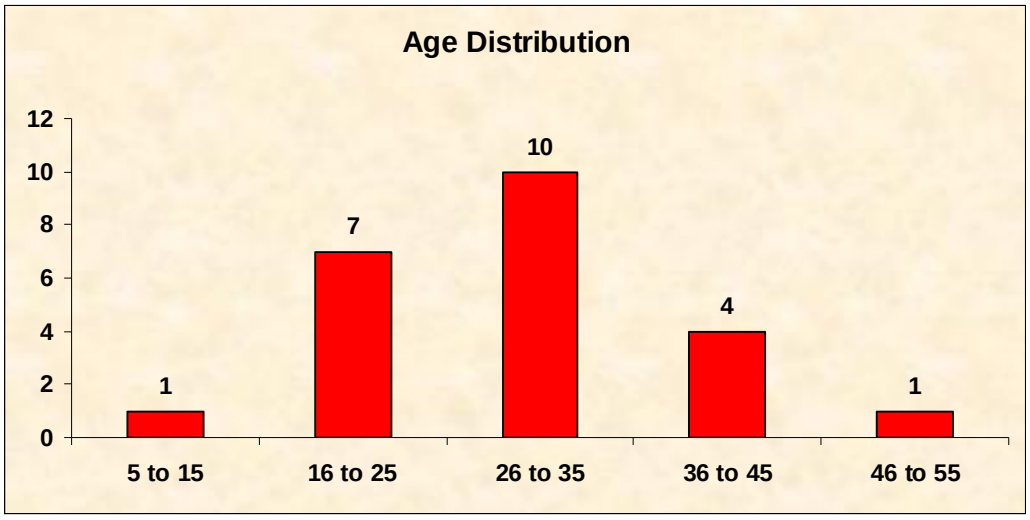
At the end of the study following data were analyzed: Demographic data such as age and sex, type of corrosive ingested, type of conduit and techniques used in primary surgery, etiology of failed neck anastomosis, investigations and mode of management.

OBSERVATION AND RESULTS

A total number of 23 patients who underwent conduit interposition for corrosive stricture esophagus presented with complications were included in the study. The age of the patients ranged from 10 to 50yrs. Most of the patients were young at age 16 to 35 years (74%) .(Tab.1)

Table-1: Age Groups

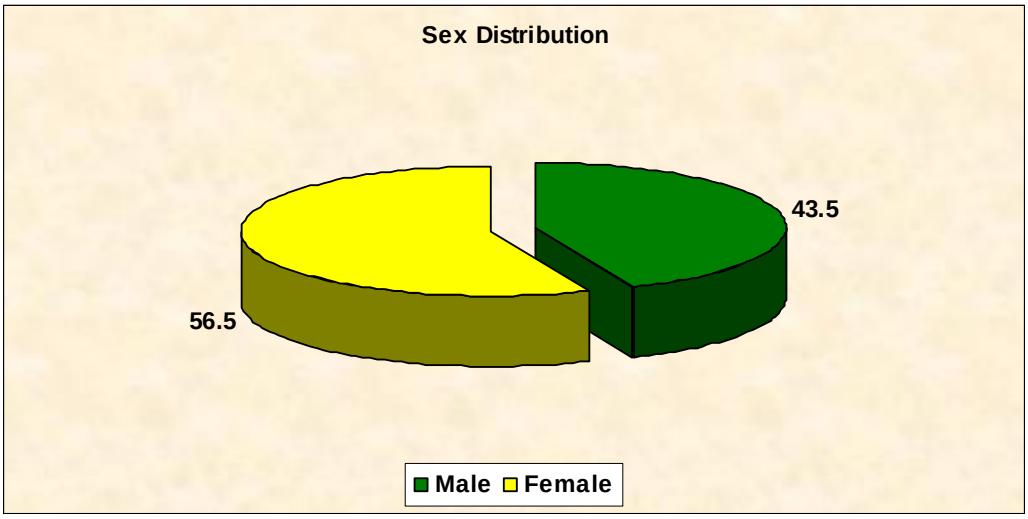
Age groups	Number
5-15	1
16-25	7
26-35	10
36-45	4
46-55	1



Out of 23 patients, 13 were females (56.5%) and 10 were males (43 .5%). (Tab.2)

Table-2: Sex Distribution

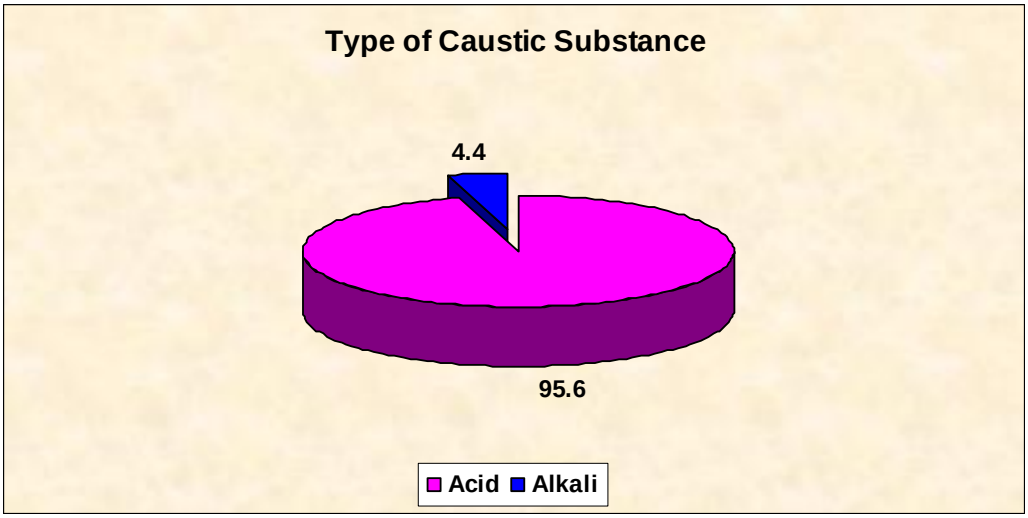
Sex	Number	Percentage
Male	10	43.5
Female	13	56.5



Most of the patients consumed acid substance (95%), and only one patient in our study consumed alkali (18.75%).(Tab.3)

Table-3: Type of corrosive substance

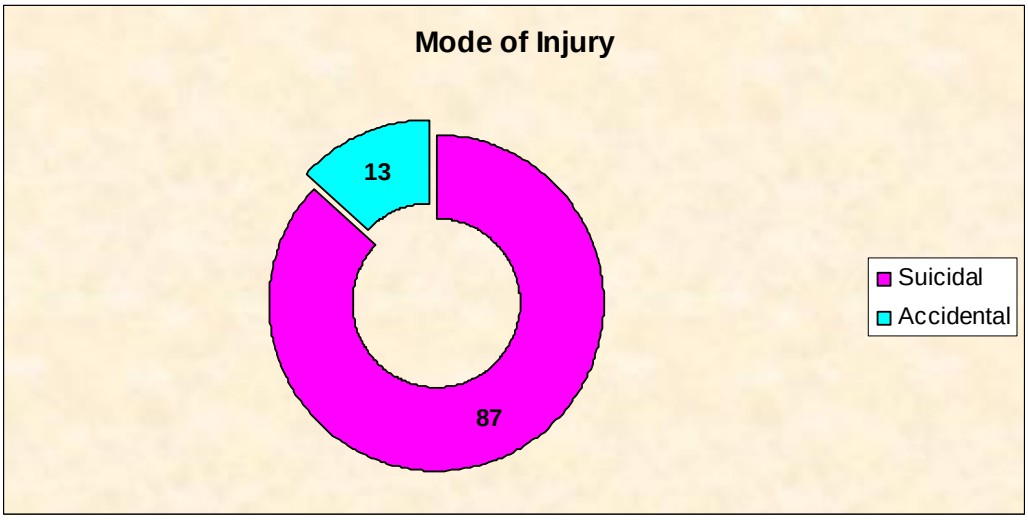
Type of corrosive substance	Number	Percentage
Acid	22	95.6
Alkali	1	4.4



In 23 patients, the corrosive ingestion was suicidal in 20 patients (87%) and in three patients, it was accidental (13%).(Tab.4)

Table-4: Mode of injury

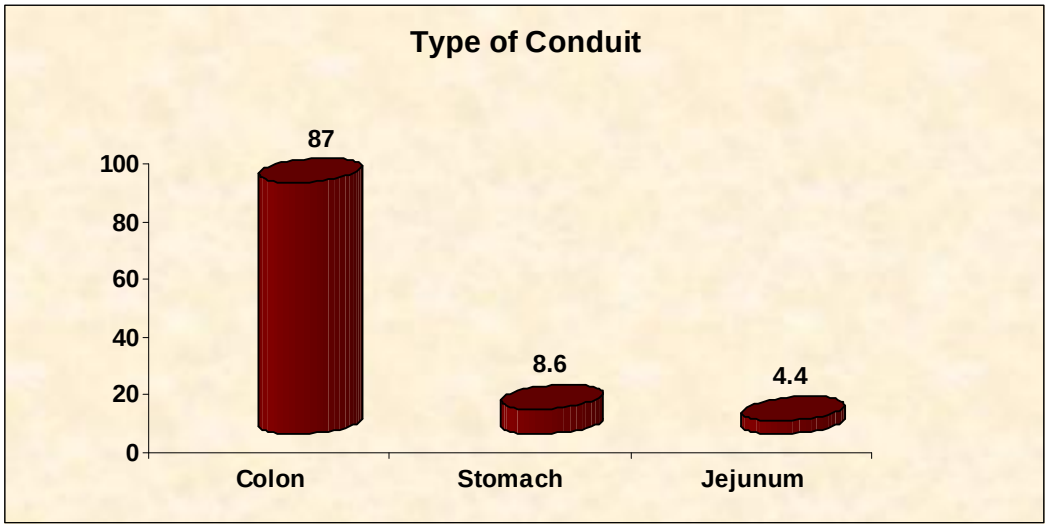
Mode of injury	Number	Percentage
Suicidal	20	87
Accidental	3	13



Stomach and colon were used as conduits for esophageal replacement. Most common conduit was colon (87%).(Tab.5)

Table-5: Type of conduit

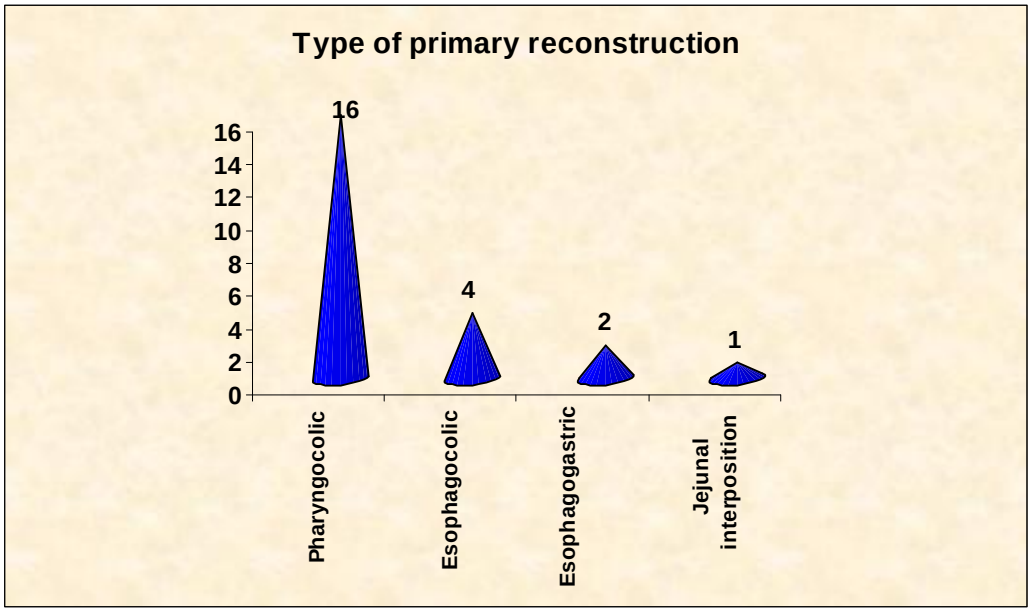
Type of conduit	Number	Percentage
Colon	20	87
Stomach	2	8.6
Jejunum	1	4.4



Of 20 patients who underwent colon bypass, Pharyngocolic type of anastomosis performed in 16 (70%) patients and esophagocolic anastomosis in 4 patients. 2 patients underwent esophagogastric anastomosis and one patient was referred to our center with failed jejunal interposition for reconstruction.(Tab.6)

Table-6: Type of primary reconstruction

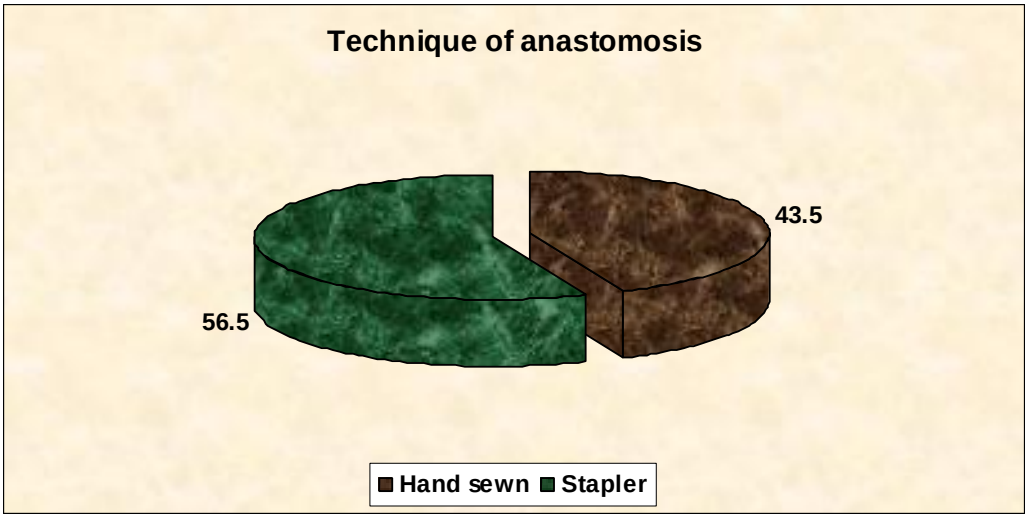
Type of primary reconstruction	No.of cases
Pharyngocolic	16
Esophagocolic	4
Esophagogastric	2
Jejunal interposition	1



In the neck, Proximal anastomosis was either performed with single layer interrupted hand suturing technique with 000 Vicryl sutures or stapling technique using 25 mm circular stapler in 10 and 13 cases respectively.(Tab.7)

Table-7: Technique of anastomosis

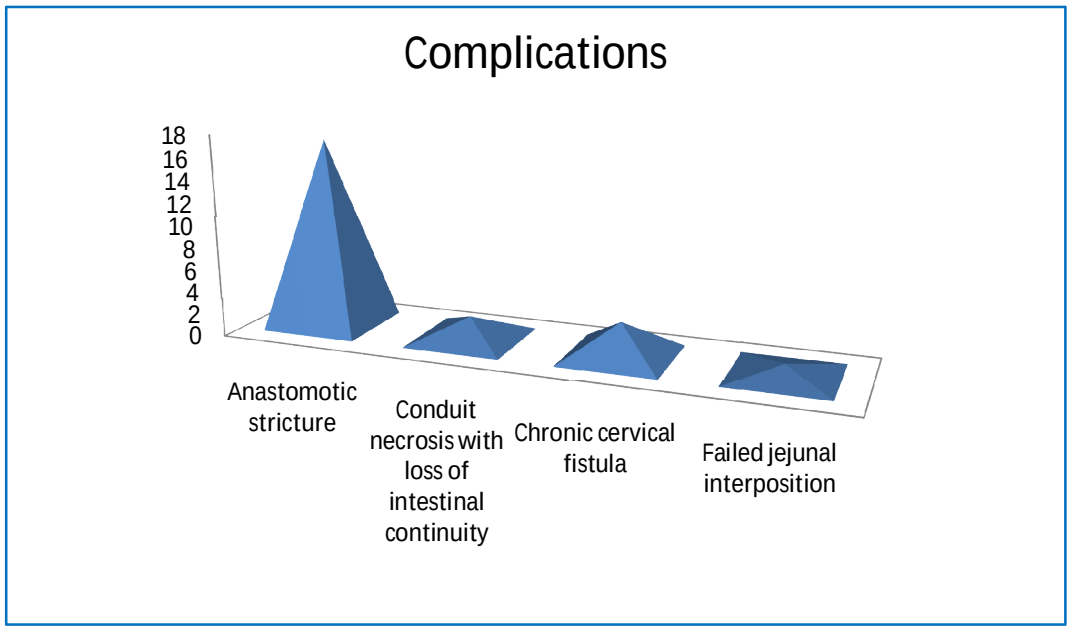
Technique of anastomosis	Number	Percentage
Hand sewn	10	43.5
Stapler	13	56.5



Types of complications that needed operative intervention (Tab.8) and various techniques used for revision procedures were described (Tab.9)

Table-8: Complications

Complications	No.of cases
Anastomotic stricture	17
Conduit necrosis with loss of intestinal continuity	2
Chronic cervical fistula	3
Failed jejunal interposition	1



The most frequent long term complication following esophageal replacement was an anastomotic stricture that occurred in 17 patients. Of 17 patients with anastomotic stricture, 7 patients were managed by dilatation therapy with Savary Gilliard bougie . In the remaining 10 patients with severe intractable stricture , surgical revision was done. Stricturoplasty, and perianastomotic fibrolysis was done in 2 patients each. 3 patients deferred dilatation and underwent resection and reconstruction of anastomosis. 2 patients who lost follow up presented later with undilatable stricture and undergone neck exploration and retrograde dilation through colotomy in one patient who had colon conduit and gastrotomy in a patient with gastric conduit . In one patient with long stricture, resection resulted in short segment loss of conduit and hence continuity was restored by advancement coloplasty technique.

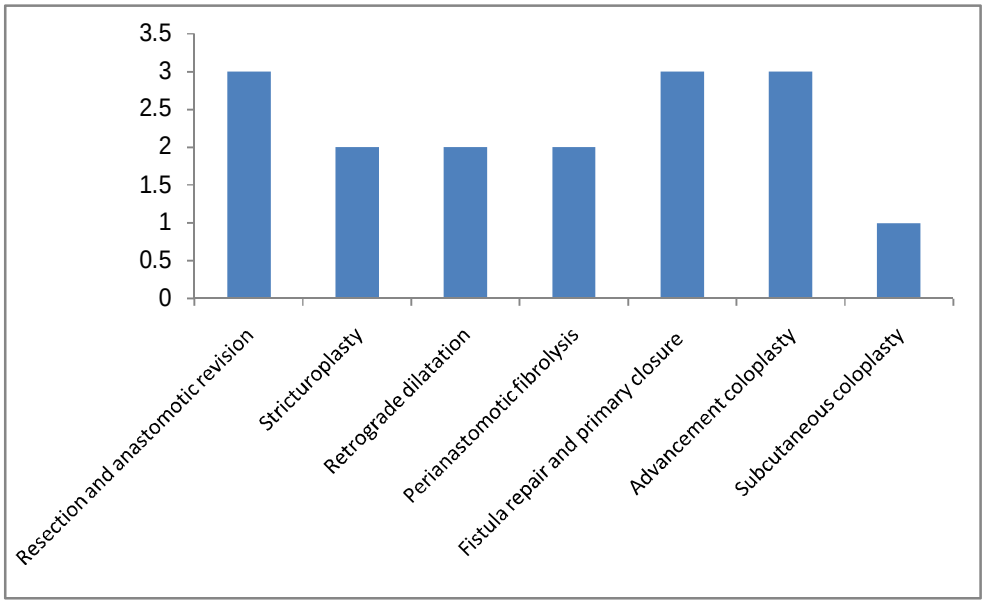
2 patients presented with short segment conduit loss due to ischemic necrosis of distal part of the conduit were managed by advancement coloplasty. 3 patients who presented with chronic cervical fistula were managed by neck exploration and fistula repair with primary closure. In a patient referred with failed jejunal interposition, intestinal continuity was restored with subcutaneous coloplasty .

Upper GI endoscopy and barium swallow study was the most important investigation used to diagnose the complication that needed

revision surgery. However in patients with loss of intestinal continuity due to conduit necrosis, Contrast enhanced CT was done to assess the remnant length and vascularity of the conduit.

Table-9: Techniques

Techniques	No of cases
Resection and anastomotic revision	3
Stricturoplasty	2
Retrograde dilatation	2
Perianastomotic fibrolysis	2
Fistula repair and primary closure	3
Advancement coloplasty	3
Subcutaneous coloplasty	1



INTRACTABLE STRICTURE – STRICTUROPLASTY

Preop picture

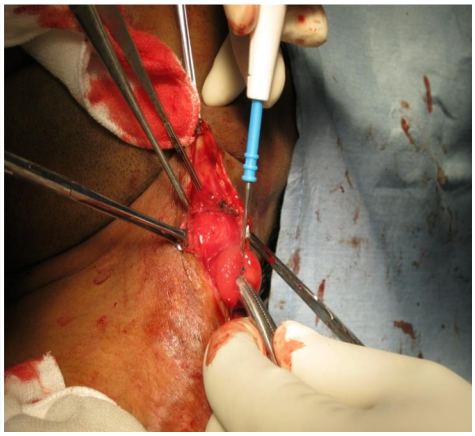
Stricture opened longitudinally

Transverse closure

completed procedure

CHRONIC CERVICAL FISTULA – PRIMARY REPAIR

Cervical fistula



Neck exploration

primary closure

post op review

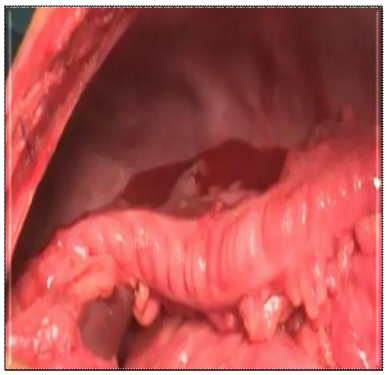
CONDUIT NECROSIS - ADVANCEMENT COLOPLASTY

Necrosed colon conduit

Necrosectomy done

Post necrosectomy status

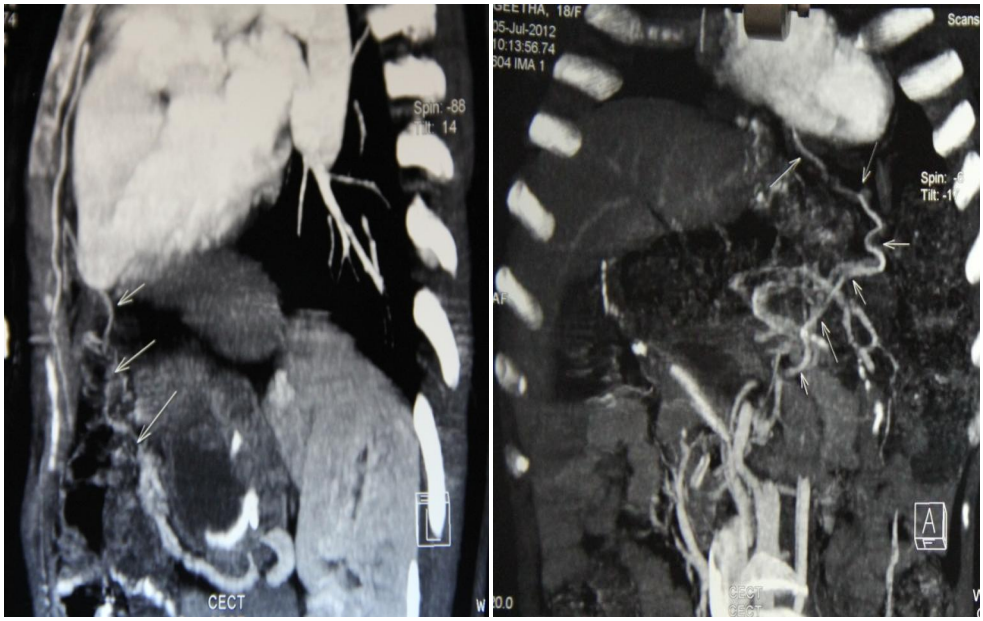
Neck exploration

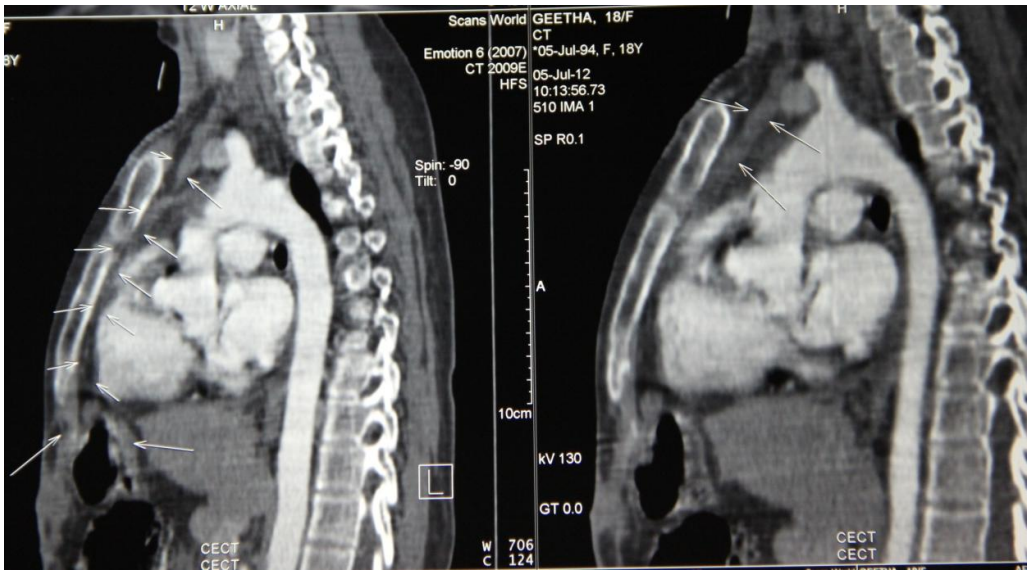


Sternotomy and mobilization of remnant conduit

CT ANGIOGRAM SHOWING CONDUIT AND

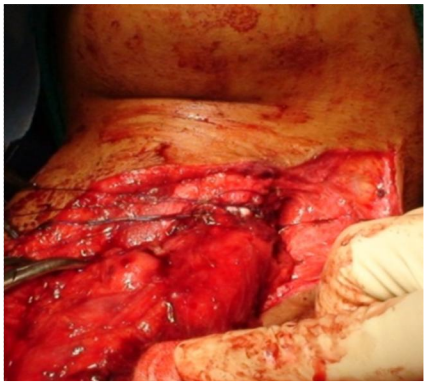
ITS VASCULAR SUPPLY





Completely mobilized conduit

Mobilized conduit reaching pharynx



Pharyngo colic anastomosis

Sternotomy closure

Post op picture

OUTCOME

Swallowing function was restored in 20 of 23 patients (87%). One patient died on postoperative day 7 due to coagulopathy who underwent advancement coloplasty with sternotomy. Failure occurred in two patients which included aspiration following stricturoplasty for intractable anastomotic stricture and persistent pharyngeal stricture secondary to alkali injury.

DISCUSSION

Management of complications following esophageal replacement surgery is a challenging problem for esophageal surgeons. Reports are limited to case reports or as outcome measures following conduit interposition for various etiologies.

Colon is the preferred substitute for conduit interposition after caustic esophageal injury. Ischemic necrosis of the colon graft is a dreadful complication after esophageal replacement surgery and best prevented by careful intraoperative preparation of the colon conduit during primary reconstruction[38]. We prefer the isoperistaltic right colon in most of our cases based on the left colic artery with preservation of middle colic artery if possible. Clamping collateral vessels with bulldog vascular clamps are done routinely to assess the viability of the conduit segment and adequate length must be determined before dividing the colon. The main vessels which include both venous and arterial pedicles are handled carefully and conduit was placed in such a way to avoid torsion and tension. Adequate dissection of the substernal path and the thoracic inlet is important to avoid compression and sometimes it may be necessary to remove a plate of left lateral end of manubrium and medial end of clavicle to create enough

space at the thoracic inlet. The incidence of compression can be reduced by these strategies during reconstructive surgeries.

When there is loss of intestinal continuity then the management is a big challenge and reconstructive options are often limited. Graft necrosis can be total or partial and in most cases distal cephalic portion of the graft is often compromised and the remaining graft can be salvaged. Location and length of intestinal defect, prior thoracic and abdominal surgery and remaining colon conduit should be assessed before reconstruction. Sepsis should be controlled, conduit bed should be free of inflammation and the patient should be nutritionally resuscitated before reconstruction. For successful revision, review of the previous operative records , thorough understanding of the patient's anatomy and vascular supply of the conduit, exploration of various options for reconstruction are required in re-establishing swallowing function . For short segment loss of graft in the neck, re-anastomosis after mobilization of preserved conduit through sternotomy can be done. If not possible, small gaps can also be bridged with free jejunal transfer with the help of a reconstructive surgeon. In our study, two patients had short segment loss of colonic conduit in the neck due to ischemic necrosis and restoration of swallowing was established by

mobilization and re anastomosis of preserved colon conduit from the neck and thorax through median sternotomy.

One patient was referred to our center, for whom jejunal interposition was attempted and completed proximal pharyngojejunal anastomosis ,but distal end of jejunal conduit was brought out as end jejunostomy subcutaneously over the manubrium sternum due to misjudgement in the assessment of length of the esophageal stricture. We restored continuity with colon interposition through subcutaneous route and anastomosed with the lower end of the jejunal graft.

The most common complication following esophageal replacement surgeries is benign strictures and most of them can be successfully managed with dilatation and in few patients, long term serial dilatation is required. The probable reason includes distal graft ischemia, cicatrization following anastomotic leaks, the high proximal anastomosis in the pharynx due to ongoing inflammation and fibrosis . Wain et al. reported an incidence of 12 out of 50 patients with dilatable anastomotic strictures after colonic bypass for caustic injuries of the esophagus. Surgical revision was required later in two patients. Curret-Scott and colleagues also reported 7 intractable strictures with colon bypass in a series of 53 patients[41] . Demeester et al and Jeyasingham reported 4 anastomotic revisions in 92

patients and 8 revisions for anastomotic stricture in 365 patients respectively[25,34]. In our series, anastomotic strictures were seen in 17 patients and most stricture occured in patients who underwent pharyngo colic anastomosis. 7of 17patients, anastomotic stricture were managed successfully by Savary Gilliard bougie dilataton.4 patients needed 5sessions of endoscopic dilatation with 2 weeks interval postoperatively and symptoms got relieved. 3patients required long term serial dilatation for persistent dysphagia and were taught self dilation technique using Foley's catheter. Patients were asked to swallow the 12 F Foley's catheter beyond the stricture site and after inflating the bulb with small amount of water, the catheter was pulled out gradually. This procedure was repeated with incremental increase in volume of the Foley's bulb till the patient feels symptomatically better .

Revision surgery in the management of intractable strictures can be challenging because of dense adhesion with scar tissue. Resection of the stricture and re-anastomosis can be done after careful lysis of adhesions with preservation of the vascular pedicle. Our approach for revision surgery in intractable anastomotic strictures are patients with long strictures and densely fibrotic short strictures that are not amenable for dilatation. 10 of 17 patients underwent revision surgery for intractable

stricture. 3 patients with short stricture underwent resection of the stricture and reanastomosis was performed. In one patient with long stricture, resection of the stricture lead to short segment loss of conduit and needed advancement coloplasty. This technique was done by complete mobilization of remnant conduit through median sternotomy without disturbing its vascularity and reanastomosis was done in the pharynx. For short stenoses, an alternative technique is stricturoplasty in which the stricture is opened in a longitudinal fashion and closed transversely using single layer interrupted fine vicryl sutures. We used stricturoplasty in 2 of 10 patients with short focal anastomotic strictures and found to have excellent functional results. In 2cases where transoral antegrade dilatation was not possible because of complete anastomotic stricture, we have done neck exploration followed by colotomy in a patient who had colon conduit and gastrotomy in a patient with stomach conduit through which guidewire was passed and retrograde dilatation was done using Savary Gillard bougie[33].In 2 cases, neck exploration and perianastomotic adhesiolysis allowed transoral antegrade dilatation and got relieved of dysphagia postoperatively.

Three patients who presented with leak in the postoperative period developed chronic cervical fistula. Repair was done with neck exploration

followed by identification and excision of fistulous communication and primary closure of the defect. Anastomotic revision was not needed in any of such patients and function was restored in all three patients.

Many literatures from western countries reported redundancy as the most common long term complication followed by intractable stricture and most complications occurred in patients who underwent long segment colon bypass. Incidence of redundancy of colonic conduit occurred in 27 out of 29 patients in Belsy's group[3]. 20 of 92 patients underwent revision surgery for redundancy in Demeester group and were the most common indication for revision surgery[25]. Currett- Scott and colleagues have also reported high re-operation rate of 37.5% with strictures and redundancy being the most common indications [41].In our center the incidence of redundancy that needed revision surgery was rare as we use isoperistaltic right colon based on left colic artery with intact middle colic artery and cologastric anastomosis was done without redundancy.

CONCLUSION

Esophageal reconstruction remains a major therapeutic challenge for surgeons involved in the care of patients with corrosive injury esophagus. Despite major advances in intraoperative and postoperative care, morbidity rates continue to be high.

Whichever conduit is chosen, the operation requires careful planning and preparation of the patient, strict attention to the technical details of the operation, and dedicated postoperative care. With the above, good function of the esophageal substitute may be achieved in about 50–65% of patients

Esophageal reconstructions often burdened with a significant percentage of postoperative complications. Management of both acute and long term complication following reconstruction is often complex and there is only limited experience about the strategies in the management of failed pharyngo esophageal reconstructions after corrosive injury esophagus in the literature. We have collected our experience regarding these complex problems and described our management strategies. Many of these repairs represent unique solutions tailored to the each type of complications that result in conduit dysfunction.

It should be emphasized that patients after such procedures should have long term follow up in specialized centers. Periodic examinations will be helpful in maintaining the function of conduit and quality of life with expert assistance and medical care. Careful evaluation of all possible reconstruction possibilities allows revision operation following conduit interposition feasible and restore conduit function in most patients.

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ANNEXURES

Case Record Proforma

Name :

Age :

Sex :

Address :

DOA: DOS: DOD:

Education status(in years)

Occupation(level)

Chief complaints

H/o Consumption of acid/alkali

H/o Intention for consumption

H/o details of reconstructive surgery

H/o associated surgery

H/o difficulty in swallowing

H/o salivary leak from neck wound

H/o cough with expectoration

H/o difficulty in breathing

H/o abdominal pain

H/o retrosternal pain

H/o abdominal distension

H/o vomiting

H/o weight loss

H/o DM,SHT,BA,TB

H/O psychiatric evaluation.

General examination with vital signs.

ENT examination

Respiratory system examination

Cardiovascular system examination

Abdominal examination

Investigations

Complete blood count

Blood sugar

Renal function tests

- Urea
- Serum creatinine

Serum electrolytes

Liver function tests

- Bilirubin
- SGOT
- SGPT
- SAP
- Total protein
- Serum albumin

Prothrombin time

INR

Blood grouping and Rh typing.

ECG

Chest X-ray

Ultrasonogram abdomen

Barium swallow study

Upper GI endoscopy

CECT Neck and Chest.

Mode of management

Dilatation method.

Type of revision surgery.

Post operative complication

outcome

In hospital morbidity and mortality

MASTER CHART

No	Name	Age/ sex	Ip.no	Intention	Agent	Extent of injury	Previous surgery	Type of conduit	character of conduit	Route	Proce dure	Anastomosis	Complication	Investigation	Revision procedure
1	vijayabhavani	16/f	49556	sucidal	acid	E+S	CE+TG+T+ FJ	colon	RC-IP-LCA&MCA	RS	EC	stapled	conduit necrosis	CECT	Advancement coloplasty
2	mahesh	35/m	101021	sucidal	acid	E+S	FJ	colon	RC-IP-LCA&MCA	RS	PC	hand sewn	stricture	BS+E	SG antegrade dilataton
3	shankar	37/m	88123	sucidal	acid	E	FJ	stomach		RS	EG	stapled	Intractable stricture	BS+E	Gastrotomy and retrograde dilatation
4	murali	27/m	10762	accidental	alkali	P+E	FJ	colon	RC-IP-LCA&MCA	RS	PC	stapled	intractable stricture	BS+E	Colotomy and retrograde dilatation
5	Gangadharan	50/m	1360	sucidal	acid	E+S	CE+T+BG	colon	LC-IP-LCA	RS	EC	hand sewn	stricture	BS+E	SG antegrade dilataton
6	Geetha	16/f	44004	sucidal	acid	P+E+S	CE+TG+T+ FJ	colon	RC-IP-LCA	RS	PC	stapled	Long seg. stricture	CECT	Advancement coloplasty
7	sulochana	20/f	59029	sucidal	acid	E+S	FJ	colon	RC-IP-LCA&MCA	RS	PC	hand sewn	stricture	BS+E	SG antegrade dilataton
8	shankar	24/m	39528	sucidal	acid	E	CE+FJ	colon	RC-IP-LCA&MCA	RS	PC	hand sewn	cervical fistula	BS+E	Neck exploration and fistula closure
9	vinodhini	19/f	2718	sucidal	acid	P+E+S	T+FJ	colon	RC-IP-LCA&MCA	RS	PC	stapled	stricture	BS+E	SG antegrade dilataton
10	prem	10/m	51387	accidental	acid	P+E	FJ	colon	RC-IP-LCA	RS	PC	hand sewn	intractable stricture	E	Stricturoplasty
11	rengammal	27/f	8423	sucidal	acid	P+E	GJ+FJ	colon	RC-IP-LCA&MCA	RS	PC	hand sewn	intractable stricture	BS+E	Stricturoplasty
12	kanmani	19/f	43283	sucidal	acid	E+S	T+FJ	colon	RC-IP-LCA	RS	PC	stapled	stricture	BS+E	SG antegrade dilataton
13	malleshwaram	30/m	76470	sucidal	acid	P+E+S	T+FJ	colon	RC-IP-LCA	RS	PC	stapled	cervical fistula	BS+E	Neck exploration and fistula closure
14	parveen	35/f	40253	sucidal	acid	E+S	FJ	colon	RC-IP-LCA&MCA	RS	PC	hand sewn	intractable stricture	BS+E	Resection and reanastomosis
15	manivannan	36/m	847896	sucidal	acid	P+E+S	T+FJ	Jejunum	Pedicled graft	RS	PJ	hand sewn	conduit necrosis	E	Subcutaneous coloplasty
16	Gomathi	35/f	49556	sucidal	acid	P+E+S	FJ	colon	RC-IP-LCA&MCA	RS	EC	stapled	intractable stricture	BS+E	Resection and reanastomosis
17	abisha	32/f	94225	accidental	acid	E+S		colon	RC-IP-LCA	RS	PC	stapled	stricture	E	SG antegrade dilataton
18	Gunammal	37/f	105463	sucidal	acid	P+E+S	T+FJ	colon	RC-IP-LCA&MCA	RS	PC	hand sewn	stricture	BS+E	Perianastomotic fibrolysis
19	kanchana	26/f	10917	sucidal	acid	E	FJ	stomach		RS	EG	hand sewn	stricture	BS+E	Perianastomotic fibrolysis
20	senthil	34/m	44275	sucidal	acid	P+E+S	T+FJ	colon	LC-AP-LCA	SC	EC	stapled	intractable stricture	BS+E	Resection and reanastomosis

21	Nambinatchiyar	27/f	86891	sucidal	acid	P+E+S	T+FJ	colon	RC-IP-LCA&MCA	RS	PC	stapled	cervical fistula	E	Neck exploration and fistula closure
22	Ragupathy	42/m	60334	sucidal	acid	P+E	T+FJ	colon	RC-IP-LCA	RS	PC	stapled	conduit necrosis	CECT	Advancement coloplasty
23	priyanka	21/f	11158	sucidal	acid	P+E+S	TG+T+FJ	colon	RC-IP-LCA&MCA	RS	PC	stapled	stricture	BS+E	SG antegrade dilataton

P-Pharynx, E-Esophagus, S-Stomach, CE-Cervical Esophagostomy, TG-Total gastrectomy,
T-Tracheostomy, FJ-Feeding Jejunostomy, BG-Billroth 1 gastrojejunosotmy, GJ-Gastrojejunosotmy,
RC-Right colon, LC-Left colon, IP-Isoperistaltic, AP-Anteperistaltic, LCA-Left colic artery,
MCA-Middle colic artery, RS-Retrosternal, SC-Subcutaneous, EC-Esophagocolic, PC-Pharyngocolic,
EG-Esophagogastric, PJ-Pharyngojejunal, BS-Barium swallow, E-Endoscopy,
CECT-Contrast enhanced Computed Tomography.

ஆராய்ச்சி தகவல் தாள்

ஆராய்ச்சி தலைப்பு: அரித்து சேதமடைந்த உணவுக்குழாய் நோய்க்கு தொண்டை மற்றும் உணவுகுழாய் மறுசீரமைப்பில் கழுத்துபகுதியில் ஏற்படும் பிணைப்பு பழுதை கையாளும் செயல்திட்டம் பற்றிய ஆராய்ச்சி

பங்கேற்பாளர் பெயர் :

ஆராய்சியாளர் பெயர் :

சென்னை இராஜீவ்காந்தி அரசு பொது மருத்துவனையில், அரித்து சேதமடைந்த உணவுக்குழாய் நோய்க்கு தொண்டை பகுதியில் ஏற்படும் பிணைப்பு பழுதை கையாளும் செயல்திட்டம் பற்றிய ஓர் ஆராய்ச்சி இங்கு நடைபெற்று வருகின்றது.

நீங்களும் இந்த ஆராய்ச்சியில் பங்கேற்க நாங்கள் விரும்புகிறோம். இந்த ஆராய்ச்சியில் அரித்து சேதமடைந்த உணவுக்குழாய் நோய்க்கு செய்யப்படும் மறுசீரமைப்பு அறுவைசிகிச்சையையும் அதனால் ஏற்படும் பக்கவிளைவுகளையும் அதனை சீர்செய்ய மறு அறுவைசிகிச்சை அல்லது அறுவைசிகிச்சை அல்லாத வேறுசிகிச்சைமுறை பற்றி ஆராயப்படுகிறது.

இந்த ஆராய்ச்சியினால் இந்த நோயால் பாதிக்கப்பட்டவர்களுக்கு தக்க சிகிச்சை முறை அளிக்க பயனுள்ளதாக இருக்கம். இதனால், உங்களது உடல்நலமோ, மனநலமோ பாதிக்கப்படாது.

முடிவுகளை அல்லது கருத்துகளை வெளியிடும்போதோ அல்லது ஆராய்ச்சியின் போதோ தங்களது பெயரையோ அல்லது அடையாளங்களையோ வெளியிடமாட்டோம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

இந்த ஆராய்ச்சியில் பங்கேற்பது தங்களுடைய விருப்பத்தின் பேரில் தான் இருக்கிறது. மேலும் நீங்கள் எந்நேரமும் இந்த ஆராய்ச்சியிலிருந்து பின்வாங்கலாம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

இந்த சிறப்பு அறுவைசிகிச்சையின் பலன்களை/ முடிவுகளை ஆராய்ச்சியின்போது ஆராய்ச்சியின்போது அல்லது ஆராய்ச்சியின் முடிவின் போது தங்களுக்கு அறிவிப்போம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

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ஆராய்ச்சியாளர் கையொப்பம் பங்கேற்பாளர் கையொப்பம்

தேதி: தேதி:

INFORMATION TO PARTICIPANTS

Title: **"Strategies in the management of failed neck anastomosis in pharyngo esophageal reconstructions after corrosive injury esophagus**

Principal Investigator:

Co-Investigator(if any):

Name of Participant:

Site :

You are invited to take part in this research/ study/procedures/tests. The information in this document is meant to help you decide whether or not to take part. Please feel free to ask if you have any queries or concerns.

What is the purpose of research?

Caustic ingestion can produce a progressive and devastating injury to the esophagus and in severe strictures, surgical replacement of the esophagus may be required. Complication following conduit interposition that requires intervention may be acute or chronic and often devastating require complex procedures to re-establish swallowing. We want to test the efficacy and safety of a new _____ (drug / intervention / surgery /procedure/lab test) in this disease/condition.

We have obtained permission from the Institutional Ethics Committee.

The study design

Retrospective study

Study Procedures

The study involves evaluation of failed pharyngoesophageal reconstruction for which we will need Barium swallow,contrast enhanced CT scan of Neck & upper gastrointestinal scopy .The planned scheduled visits involve visits at _____,_____,____, and_____(days/ weeks) after your initial visit. You will be required to visit the hospital _____ number of times during the study.

At each visit, the study physician will examine you. Some [blood / urine / other] tests will be carried out at each visit. [… … ml of blood will be collected at each visit. Blood collection involves prick with a needle and syringe.] These tests are essential to monitor your condition, and to assess the safety and efficacy of the treatment given to you.

In addition, if you notice any physical or mental change(s), you must contact the persons listed at the end of the document.

You may have to come to the hospital (study site) for examination and investigations apart from your scheduled visits, if required.

Women of childbearing potential

You must not participate if you are pregnant, breastfeeding a child, or if you are of childbearing potential and not practicing effective methods of contraception **(for studies/procedures which may harm the fetus).**

Possible risks to you – If any, Briefly mention

Possible benefits to you - If any, Briefly mention

Possible benefits to other people

The results of the research may provide benefits to the society in terms of advancement of medical knowledge and/or therapeutic benefit to future patients.

Confidentiality of the information obtained from you

You have the right to confidentiality regarding the privacy of your medical information (personal details, results of physical examinations, investigations, and your medical history). By signing this document, you will be allowing the research team investigators, other study personnel, sponsors, Institutional Ethics Committee and any person or agency required by law like the Drug Controller General of India to view your data, if required.

The information from this study, if published in scientific journals or presented at scientific meetings, will not reveal your identity.

How will your decision to not participate in the study affect you?

Your decision not to participate in this research study will not affect your medical care or your relationship with the investigator or the institution. You will be taken care of and you will not loose any benefits to which you are entitled.

Can you decide to stop participating in the study once you start?

The participation in this research is purely voluntary and you have the right to withdraw from this study at any time during the course of the study without giving any reasons. However, it is advisable that you talk to the research team prior to stopping the treatment/discontinuing of procedures etc.

Signature of Investigator Signature of Participant

date date

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To

Dr.B.Kesavan,
III Year, M.Ch Post Graduate in Surgical Gastro Enterology,
Center of Excellence for upper G.I. Surgery,
Madras Medical College & RGGGH, Chennai -3

Dear Dr.B.Kesavan,

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled "Strategies in the management of failed neck anastomosis in pharyngo esophageal reconstructions after corrosive injury esophagus" No.14022013.

The following members of Ethics Committee were present in the meeting held on 05.02.2013 conducted at Madras Medical College, Chennai -3.

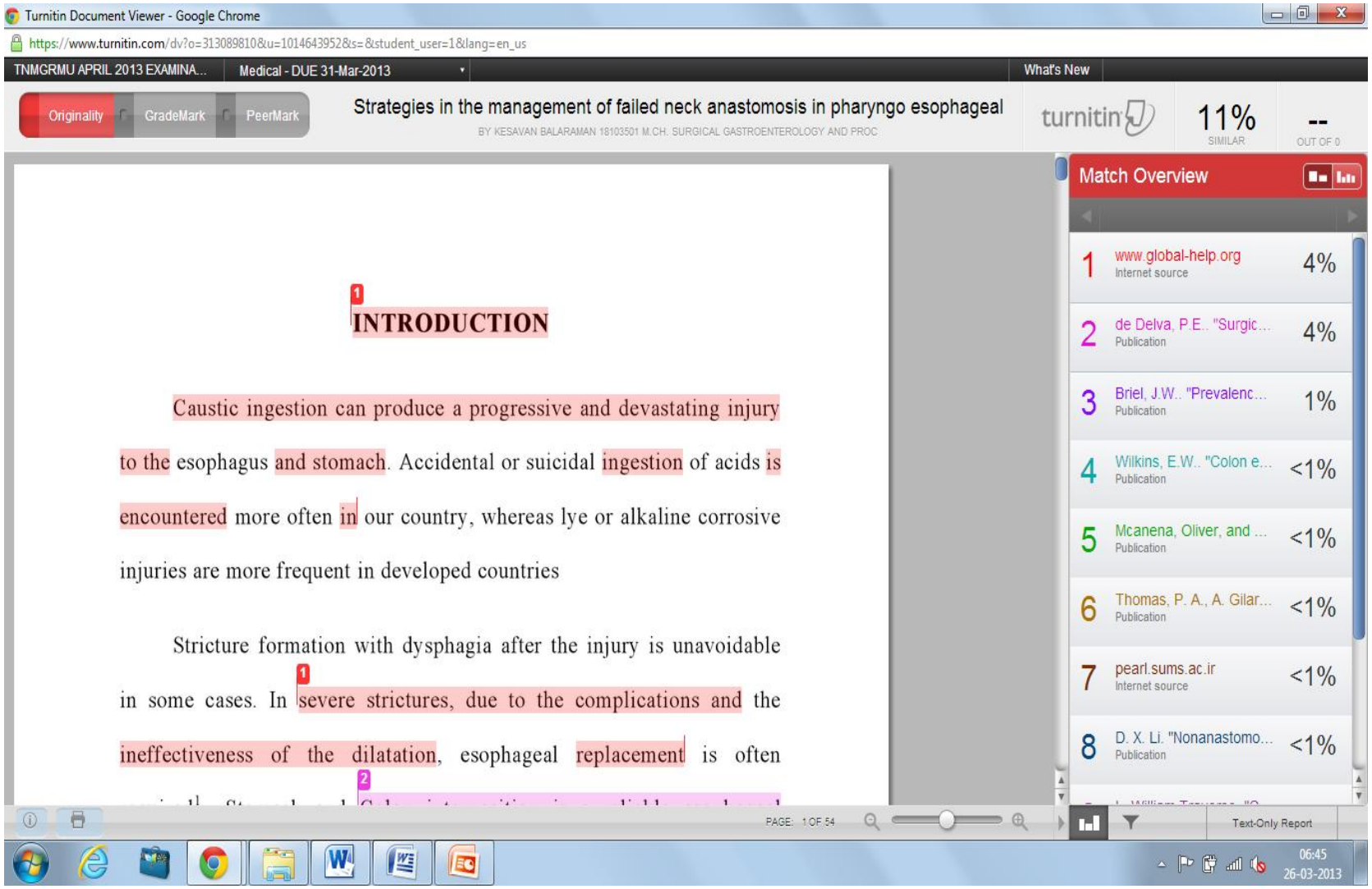
1.	Dr.SivaKumar, MS FICS FAIS	--- Chairperson
2.	Prof. R. Nandhini MD Director, Instt. of Pharmacology ,MMC, Ch-3	-- Member Secretary
3.	Prof. Shyamraj MD Director i/c , Instt. of Biochemistry , MMC, Ch-3	-- Member
4.	Prof. P. Karkuzhali. MD Prof., Instt. of Pathology, MMC, Ch-3	-- Member
5.	Prof. A. Radhakrishnan MD Prof of Internal Medicine, MMC, Ch-3	-- Member
6.	Prof. S. Deivanayagam MS Prof of Surgery, MMC, Ch-3	-- Member
7.	Thiru. S. Govindsamy. BABL	-- Lawyer
8.	Tmt. Arnold Soulina MA MSW	-- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

RNadini 22/2/13
Member Secretary, Ethics Committee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INTRODUCTION
Caustic ingestion can produce a progressive and devastating injury to the esophagus and stomach. Accidental or suicidal ingestion of acids is encountered more often in our country, whereas lye or alkaline corrosive injuries are more frequent in developed countries
Stricture formation with dysphagia after the injury is unavoidable in some cases. In severe strictures, due to the complications and the ineffectiveness of the dilatation, esophageal replacement is often
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